

## CLAIMS

1. A multimode dielectric resonator device comprising a dielectric core disposed in a cavity, said dielectric core  
5 producing a first TM<sub>01δ</sub> mode or TM<sub>011</sub> mode having an electric field directed in a first direction, a second TM<sub>01δ</sub> or TM<sub>011</sub> mode having an electric field directed in a second direction perpendicular to the first direction, a first TE<sub>01δ</sub> mode having an electric field rotated in a plane  
10 perpendicular to the first direction, and a second TE<sub>01δ</sub> mode having an electric field rotated in a plane perpendicular to the second direction, respectively,

wherein effective dielectric constants of individual dielectric core portions having electric flux of an even-  
15 mode and an odd-mode of TE coupling mode in the first and the second TE<sub>01δ</sub> modes passing therethrough are different with each other, and effective dielectric constants of individual dielectric core portions having electric flux of an even-mode and an odd-mode of TM coupling mode in the  
20 first and the second TM<sub>01δ</sub> or TM<sub>011</sub> mode passing therethrough are substantially equal.

2. The multimode dielectric resonator device according to claim 1, wherein the amount of protrusion or the amount of subsidence of the dielectric core portions having electric  
25 flux passing therethrough has a difference between an even

mode and an odd mode of the TE coupling mode, and a subsidence or protrusion for canceling frequency changes between the even mode and the odd mode of the TM coupling mode by the difference of the amount of the protrusion or the amount of the subsidence is disposed on the dielectric core portion having a relatively small electric flux density of the TE coupling mode.

3. A multimode dielectric resonator device including four-stage resonators having the first TM<sub>01δ</sub> mode or TM<sub>011</sub> mode, the first TE<sub>01δ</sub> mode, the second TE<sub>01δ</sub> mode, the second TM<sub>01δ</sub> mode or TM<sub>011</sub> mode coupled in sequence by coupling the first and the second TE<sub>01δ</sub> modes with the first and the second TM<sub>01δ</sub> mode or TM<sub>011</sub> mode, respectively, by displacing a center of electric field distribution of the first and the second TM<sub>01δ</sub> modes or the first and the second TM<sub>011</sub> modes upwardly or downwardly in planes perpendicular to the directions of the electric fields of the first and the second TM<sub>01δ</sub> modes or the first and the second TM<sub>011</sub> modes.

4. A dielectric filter comprising: a multimode dielectric resonator device according to claim 3; and external coupling means for externally coupling the first-stage and the last-stage resonators, respectively, out of the four-stage resonators constituting the multimode dielectric resonator device.

5. A composite dielectric filter comprising two pairs of

the dielectric filters according to claim 3, wherein external coupling means of each one of individual dielectric filters are shared.

6. A communication apparatus comprising the dielectric  
5 filter according to claim 4, or the composite dielectric filter according to claim 5 in a high-frequency circuit portion.